CHAPTER 5
RESEARCH ANALYSIS RESULT

After implementing during APR 98- SEP 98 in accordance with the proposed methods as mentioned in chapter 4This chapter will evaluate the result of the proposed methods. This evaluation will analyzeupon incoming quality control data and suppliers' supplied data. Relationship between suppliers and MOLEX Thailand Ltd., is very important for our business Supplier Quality Management achievement needs strong support from the suppliers and improvement will have to proceed together between suppliers and MOLEX Thailand LTD,.

5.1 Incoming Quality Control Improvement

5.1.1 Incoming Quality Control Process

In practical, incoming quality control inspection method work instruction was written upon the method process as proposed in figure 4.3 in chapter 4. IQC inspectors have been trained in accordance with this work instruction. Training method have been conducted in 2 steps.

1. Introducing work instruction to IQC inspectors , this step has been done privately away from the shop floor in order to avoid noise from many machines in the shop floor and also, discussion after training can be continued comfortably in the training room. Main topics that were concentrated are the method to use the sampling plan MIL STD 105E and the switching switching rule reduced , normal and tightened level.

2. On the job training at IQC area, this is to perform IQC inspection in accordance with step 1 in order to test IQC inspector whether they can understand the process of proposed IQC method.

Work instruction for incoming quality control process, have been used by IQC inspectors. In the fact that they will have to follow up this work instruction and record IQC data correctly so that engineer can use IQC data effectively. Form of IQC data record for IQC inspectors have been developed in order to collect the data by week and by month as shown in table 5.1,

SUPPLIER Name	Total Incom lots	Total dropped lots	Total Inspec lots	Total Rej lots	% LAR	Total Sample Size	Total Rej parts	DPM	Line feed back (Items)	% LFB ratio	MQR	Remark
Total												

Table 5.1 : Blank Form of IQC Weekly Record for collecting IQC data.
Source: IQC weekly record of MOLEX Thailand LTD

It can be seen that 2 training step to introduce this work instruction and the method to record IQC data were understood properly although they have some questions when they do inspection but the answers have been given sufficiently to them . And those IQC data as mention in table 5.1 will be utilized in the section 5.4 IQC data utilization to evaluate supplier performance. IQC data will be verified upon IQC data record.

5.1.2 IQC Inspection Plan

IQC inspection plans are distributed to incoming quality control section. Informal meeting is held to explain how supplier manufacturing flows are developed to be these IQC inspection and how they link to IQC inspection check sheet for IQC inspection method. The purpose of this discussion is that IQC supervisor can understand correctly to these inspection plan and IQC inspection check sheet. What related work instructions will IQC inspectors have to use.

For example, in figure 4.5 (in chapter 4) IQC inspection plan for Pan International Wire & Cable products, the inspection plan have been identified that IQC will have to inspect on many criterion such as conductor surface check, thickness/concentricity and bond strength check in accordance with related work instructions. And these inspection criterion will be in the IQC inspection sheet as shown in figure 5.1 IQC inspection check sheet.

It can be said the proposed method have been used effectively, users can understand that what they have to do (inspect), how do these inspection criteria come from? These inspection plan will be updated upon the supplier manufacturing flow updated information.

INCOMING INSPECTION CHECKLIST

Molex Thailand Co., Ltd. Product /Type | IQ No.

Vendor

No.	Check Point	Spec.	Tool	Remark	Rev.	Description
	Visual Inspection					
1	Wire / Cable Type					
2	AWG					
	Insulator Surface Check					
3	Damaged Insulator					
4	Wrong Color					
5	Rating				Date	
6	Poor Packing					
	Conductor Surface Check				Prepared by	
7	Poor conductor coating / soldering					
8	Damaged cond. /Scratch				Approved by	
9	Drain Wire					
	Jaket Check					
10	Damaged Jacket					
11	Jacket Color					
12	Separator					
	Label Check					
13	UL Tag					
14	Poor UL Tag Printing					
15	Approve Supplier List					
16	Others					
	Dimension/Functional Test			Table of AWG : Color /Spec.		
		Spec/Cores	**Spec/Cores**	**Spec/Cores**	**Spec/Cores**	**Spec/Cores**
17	Insulation OD					
18	Jacket OD					
	Color / Part no.					

THQA-0060-B

Figure 5.1: IQC Inspection Check Sheet (Developed from IQC Inspection Plan)

5.1.3 Ship To Stock Program (STS)

According to proposed Skip and Ship to Stock Program (Reduced Inspection And Dock to Stock Program) as shown infigure 4.9 (chapter 4) , it can be seen that only supplier B meets the requirement of LAR 98 % and production complaint (line feed back) 0.8 % over six consecutive months as shown in graph 5.1-A.

From Graph 5.1-A, B,C: Individual Material Quality Monitoring Graph at IQC gate and production line to supplier A, C, D, E, F. Material quality problem has occurred either during IQC inspection or production. This makes those supplier be not able to apply to ship to stock program.

Score for STS program in accordance with proposed method in chapter 4.2.2.4 Ship to stock program performance (10%) is shown in table 5.2 . This data was summarized from table 5.3(Products summary for Skip & Ship To Stock Program, supplier B).

Ship To Stock Program monitors individual products being supplied by supplier B. All products of supplier B are in PHASE I (skip 3 lots, inspect 1 lot) as shown in table 5.3.

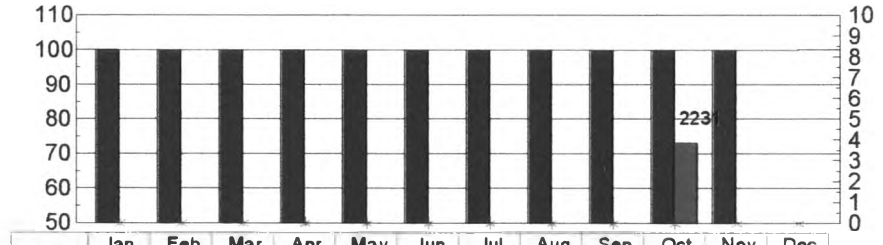
Phase	No. of part	Weight	Score
100%Lot Inspection	0 of 107	10	0
Phase I	107 of 107	15	15
Phase II	0 of 107	20	0
Phase III	0 of 107	25	0
STS	0 of 107	30	0
Total	**107**	**100**	**15**
Convert to Score 10			**5**

Table 5.2: Score calculation to supplier B 's products (PHASE I)
Source: Table 5.3 :Products summary for Skip & Ship To Stock Program, supplier B (Data have been collected from Monthly IQC ship to stock program report)

From the table 5.2 total score is 15 % and then it is converted to score by multiplying 10 then divided by 30 [15 *(10/30)]. STS Score for supplier B is 5 marks. The other suppliers who their products are inspected 100% (all products) at IQC. STS score is
3.33 marks [1*(10/30)] .

Supplier B
STS Program

Lot Acceptance Rate **Line Feed Back**

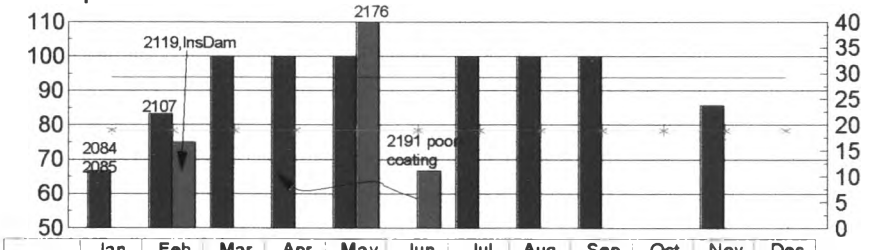


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% LAR	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
Goal	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
%LFB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.85	0.00	
Goal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HBC is under ship to stock program.

Supplier C

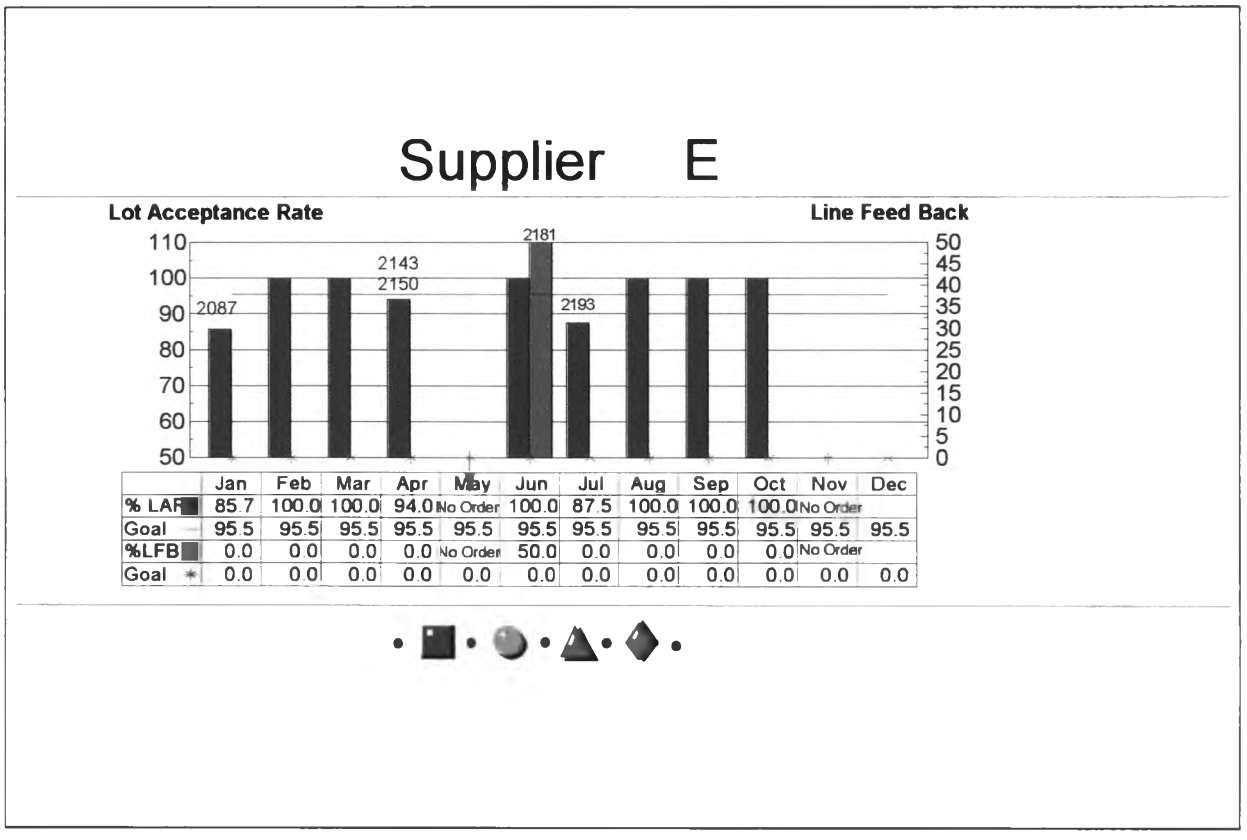
Lot Acceptance Rate **Line Feed Back**

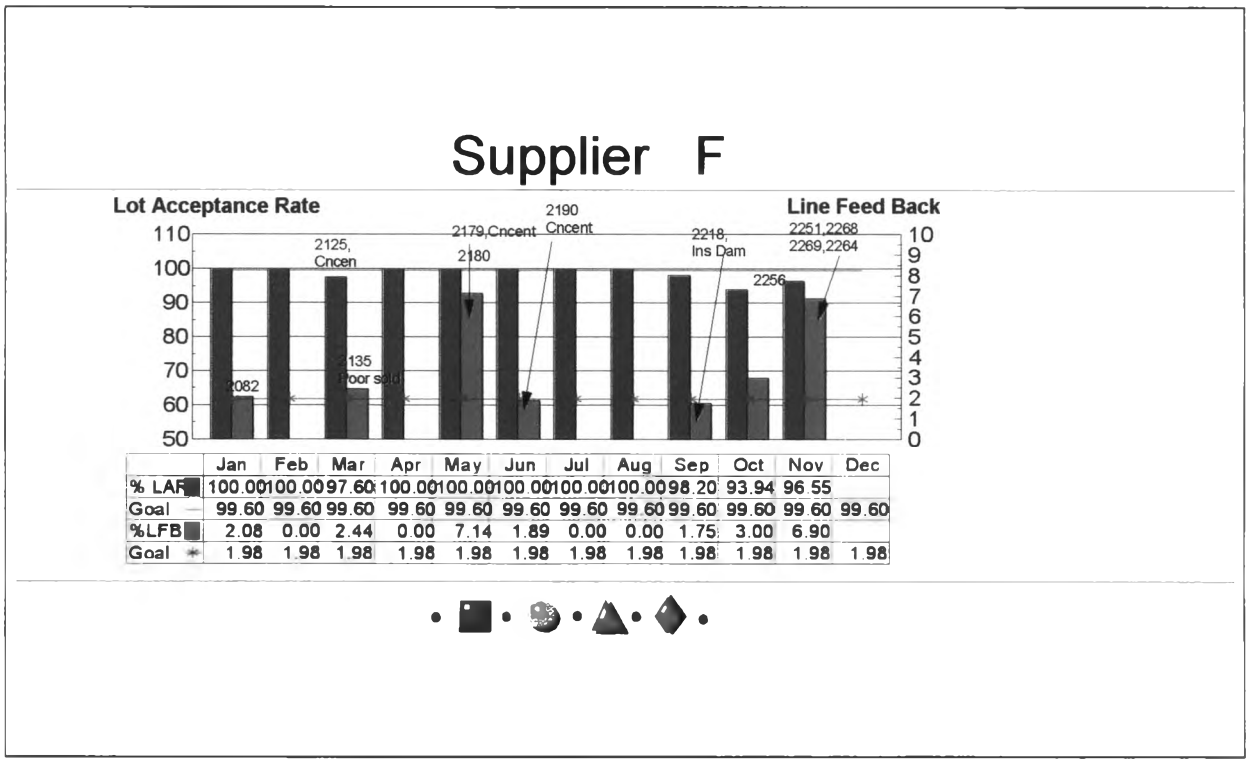


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% LAR	66.67	83.30	100.00	100.00	100.00	no order	100.00	100.00	100.00	no order	85.71	
Goal	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00
%LFB	0.00	16.67	0.00	0.00	100.00	11.11	0.00	0.00	0.00	no order	0.00	
Goal	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00

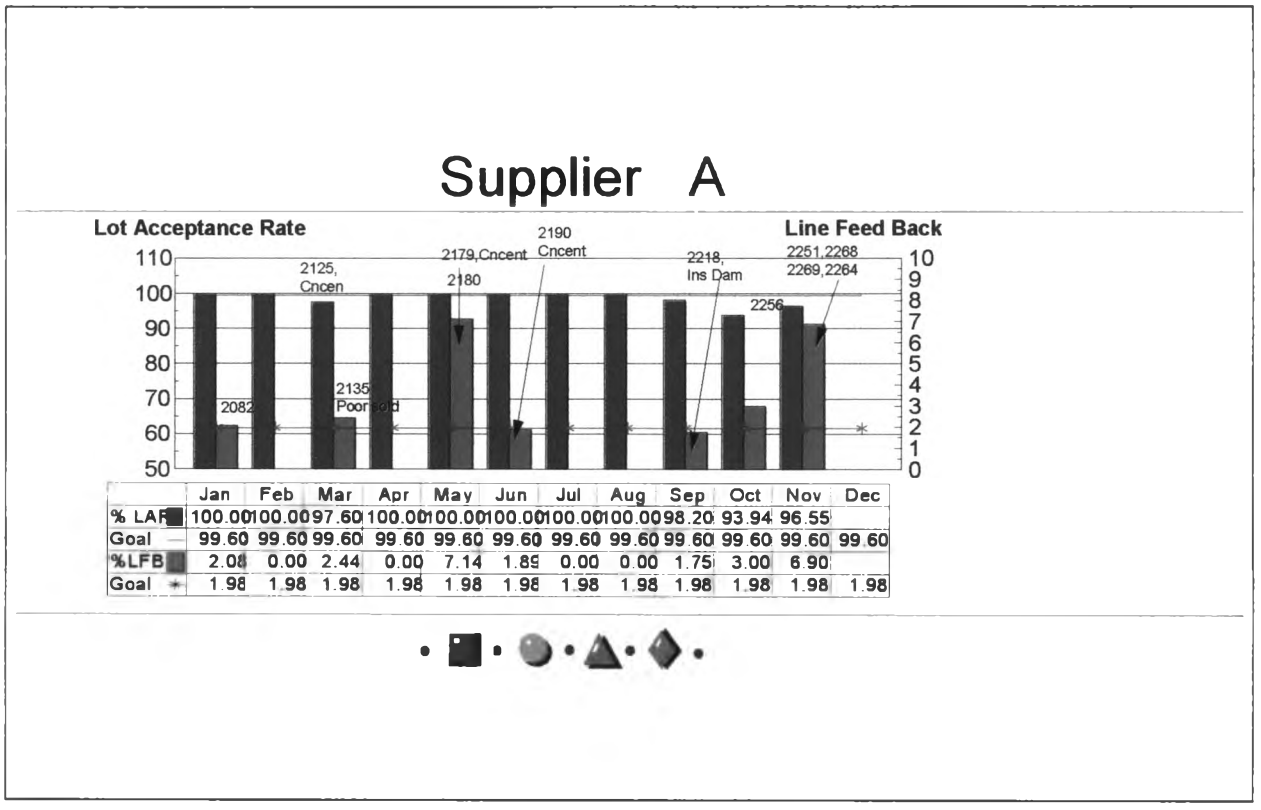
HR Silvine: MQR 2191 in Jun , belonging to Apr

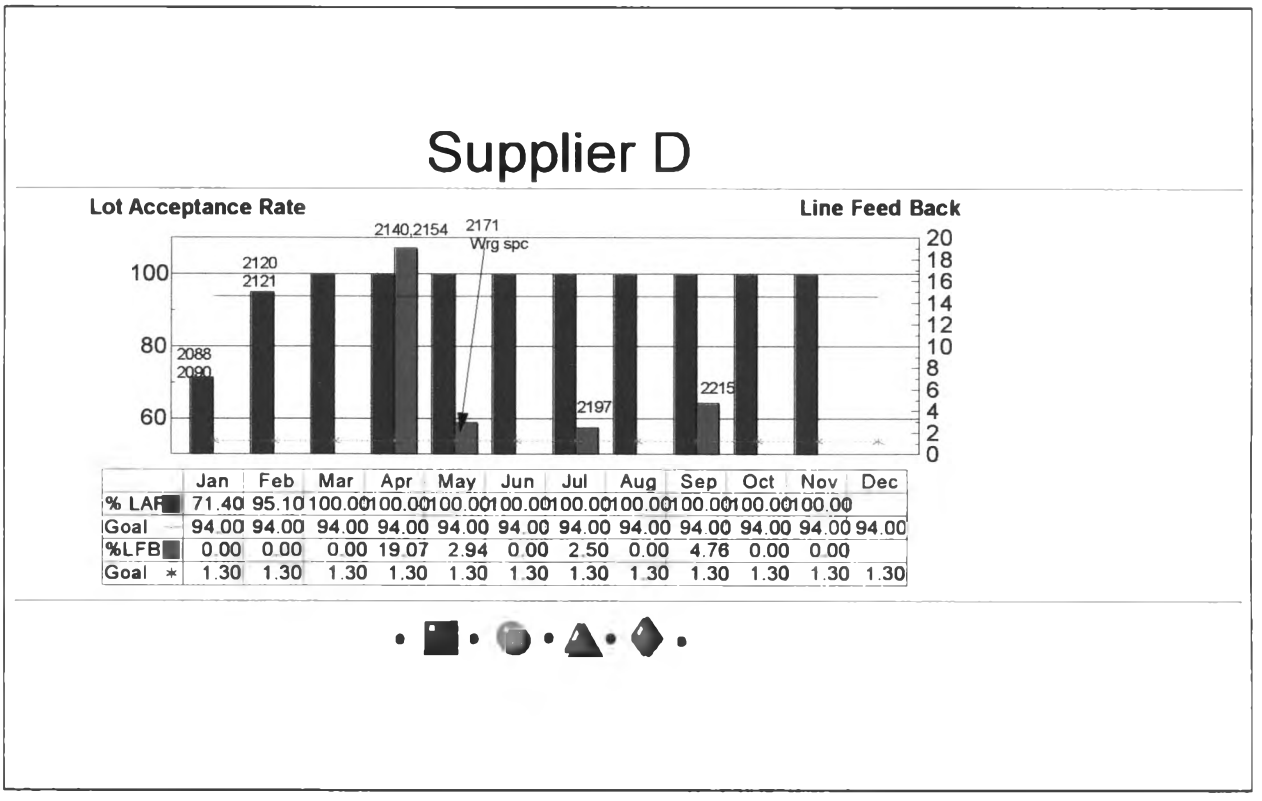
Graph 5. 1A: Individual Material Quality Monitoring Graph at IQC gate and production line (Supplier B and C)





Graph 5. 1B : Individual Material Quality Monitoring Graph at IQC gate and production line (Supplier E and F)





Graph 5.1 C: Individual Material Quality Monitoring Graph at IQC gate and production line (Supplier A and D)

Product Part No.	Total Incom Lots	Total Skip Lots	Total Inspec Lots	LAR %	Inspec Qty	Rej. Qty	PPM	Phase I	%	Phase II	Phase III	Ship to Stock
89880-0123	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0124	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0125	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0126	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0127	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0128	7	6	1(4th)	100%	7800	0	0	7	6.54%	-	-	-
89880-0129	6	5	1(4th)	100%	1800	0	0	6	5.61%	-	-	-
89880-0278	1	1	0	100%	1200	0	0	1	0.93%	-	-	-
89880-0302	5	4	1(4th)	100%		-	-	5	4.67%	-	-	-
89880-0304	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0305	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0309	4	3	1(4th)	100%	1200	0	0	4	3.74%	-	-	-
89880-0312	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0313	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0314	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0331	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0370	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0371	7	6	1(4th)	100%	4800	0	0	7	6.54%	-	-	-
89880-0372	7	6	1(4th)	100%	600	0	0	7	6.54%	-	-	-
89880-0389	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0399	5	4	1(4th)	100%	1200	0	0	5	4.67%	-	-	-
89880-0400	5	4	1(4th)	100%	1220	0	0	5	4.67%	-	-	-
89880-0402	3	3	0	100%	-	-	-	3	2.80%	-	-	-
89880-0404	2	2	0	100%	-	-	-	2	1.87%	-	-	-
89880-0411	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0418	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0424	4	3	1(4th)	100%	-	-	-	4	3.74%	-	-	-
89880-0425	6	5	1(4th)	100%	1200	0	0	6	5.61%	-	-	-
89880-0427	1	1	0	100%	-	-	-	1	0.93%	-	-	-
89880-0434	6	5	1(4th)	100%	1200	0	0	6	5.61%	-	-	-
89880-0435	5	4	1(4th)	100%	600	0	0	5	4.67%	-	-	-
89880-0436	7	6	1(4th)	100%	1200	0	0	7	6.54%	-	-	-
89880-0446	7	6	1(4th)	100%	600	0	0	7	6.54%	-	-	-
89880-0473	4	3	1(4th)	100%	7800	0	0	4	3.74%	-	-	-
Total	**107**	**92**	**15**	-	-	-	-	**107**	**100%**	-	-	-

Table 5.3 : Products summary for Skip & Ship To Stock Program, Supplier B

Source : Monthly IQC ship to stock program report during Jul - Aug

5.1.4 IQC data utilization to evaluate supplier performance

IQC data utilization covers three quality factors , lot acceptance rate, defect per million at IQC inspection area and material quality problem from production line as shown in table 5.4. This section will also evaluate score for supplier periodic evaluation (supplierperformance rating) that will be concluded in the supplier periodic evaluation section .

SUPPLIER	Total recev. lots	Total skip lots	Insp. lots	Total rej. lots	% LAR	Total sample size	Total rej. parts	DPM	Error Sample (Items)	% Lots rejected	LAR & DPM Score (marks)	SQP Score (marks)
A	126	-	126	0	100	246,440	0	0	1	0.79%	15+ 15	10
B	107	92	15	0	100	27,750	0	0	0	0.00%	15+15	15
C	7	-	7	0	100	37,480	0	0	0	0.00%	15+15	15
D	120	-	120	0	100	398,060	0	0	2	1.67%	15+15	5
E	19	-	19	1	94.74	27,730	300	10,818.61	0	0.00%	7+ 13	15
F	44	-	44	1	97.73	716,304	9,906	13,829.32	1	2.27%	10+13	10
Total	316	-	316	2	99.37 %	1,453,764	10,206	7,021.33	4	1.27%		

Table 5.4 : IQC data record summary for supplier performance evaluation .

Source : IQC monthly report during Jul-Sep of MOLEX Thailand LTD.

- 5.1.4.1 Lot Acceptance Rate & Defect Per Million

From table 5.4, it can be seen that no rejected lot was found the quality problem during incoming quality control inspection (IQC) on the products that had been supplied by supplier A, B, C and D. It can be said that incoming quality inspection section do not detect any material quality problem. The score of LAR is 15 (100 % lot acceptance rate) with DPM score 15 (no rejected lot found) for these three supplier.

There is one rejected lot on the product that was supplied by supplier E. Wrong color of tube product was found at IQC section. Supplier E had supplied the product 19 lots over 3 months. One rejected lot was rejected during IQC inspection that total DPM is 300 (total rejected parts) over 27,730 (total sample size)that equals 10,818 DPM.

Total % LAR therefore is 94.74%. From table 5.5: Raw Material LAR and DPM Score (Translation table) , supplier E obtains score 7 (of full score 15) with DPM score 13 (of full score 15).

% LAR (Full Score 15 %)		DPM (Full Score 15%)	
100-99.8	15 %	0 - 9,999	10%
99.70-99.6	14 %	10,000-19,999	9%
99.50-99.4	13 %	20,000-29,999	8%
99.30-99.2	12 %	30,000-39, 999	7%
99.10-99.0	11 %	40,000-59,999	6 %
98.90-97.0	10 %	60,000-69,999	5%
96.90-95.0	9%	70,000-79,999	3%
94.90-93.0	7%	8,0000-89,999	1%
92.9-91.0	5%	More than 90,000	0%
90.9-85.0	3%		
Less than 85.0	0%		

Table 5.5: Raw Material LOT ACCEPTANCE RATE and DEFECT PER MILLION Score (Translation Table)

Source: Standard translation table from supplier periodrating procedure THQA-0038 of MOLEX Thailand LTD.

Two rejected lots from supplier F was found to fail because of color tone deviation of PVC insulated wire during IQC inspection. After investigation, we found that mis-communication occurred between MOLEX Thailand LTD(product engineer/purchaser) and supplier staff during new product development process. As a result, this lot was accepted upon MOLEX Thailand LTD, 's making decision. We did feed back to this supplier to correct specification It can be said that effective communication needed during new product development of MOLEX Thailand LTD . Supplier and MOLEX Thailand Ltd. will have to make clear each other on the specification. Initial sample submission is required before purchasing. However, this is the issue that is not required supplier corrective action because it is not functional problem.

Supplier F had supplied totally 44 lots and 1 of them was rejected because of color tone deviation. According to IQC section data ,total sample size upon 44 lots is 716,304 unit and total rejected part of one lot is 9,906 that equals 13,829 Defect Per Million. LAR score 97.73 % is 10 for Pan supplier with 13 DPM score (marks) .

- 5.1.4.2 Material Quality Problems:

-Production Complaint (Line Feed Back) :Production feeds back the defects because of poor quality of material. The process of production complaint handling is as figure 5.2 production complaint (material problem) handling. There are 4 production complaint items over this period.

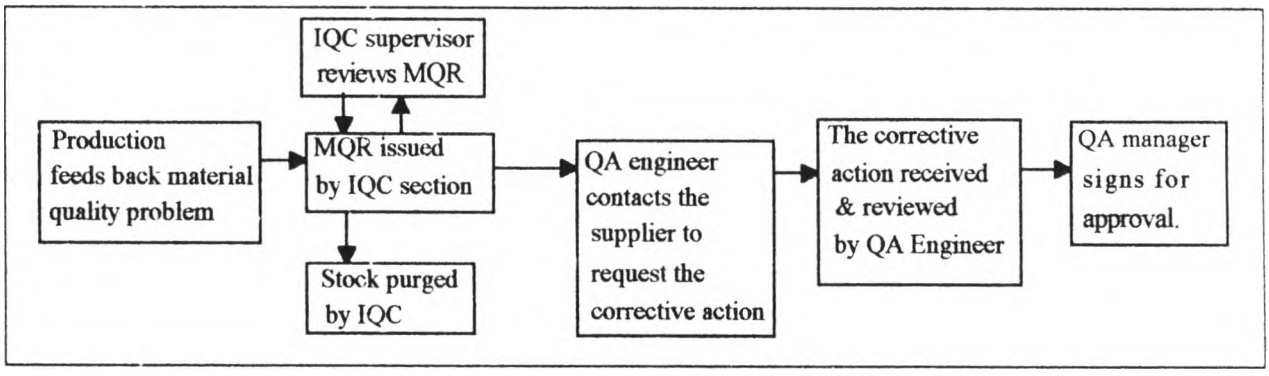


Figure 5.2 : Production Complaint (Material Problem) Handling

From table 5.4, there is no production complaint on the products that were supplied by supplier B ,C and E . The material quality problem score 15 marks had been given to these three suppliers.

One rejected lot which was supplied by Pan International Wire & Cable supplier, was rejected because of outer diameter of PVC insulated wire over specification. This caused in cutting / stripping failure in the production line of MOLEX Thailand LTD . And also, corrective action reports are required for failure that occurred because of Furukawa Electrics and Thai Wonderful Wire & Cable supplier as shown in table 5.6 : production complaint on the material quality.

Supplier	Total Received Lots	Production Complaint Item	% Defect Ratio	Defect Criteria	Corrective Action Response	Ref no.
A	126	1	0.79%	Damaged PVC wire	Required	2218
D	120	2	1.67%	Poor PVC insulation alignment (1), Damaged PVC Wire (1)	Required	2197, 2215
F	44	1	2.27%	Outer Diameter over spec.	Required	2219

Table 5.6 : Production complaint on the material quality
Source : IQC monthly report during Jul - Sep of MOLEX Thailand LTD.

From the figure 5.2, material quality report will be issued in order to ask for the supplier corrective action reports. The containment (interim) action from the supplier will have to be done immediately in the supplier ware house. All current stock will have to be inspected so that the next lot will not be rejected because of this defect criteria. In the same way, IQC inspection gate will have to inspect the current quantity in MOLEX Thailand Ltd. warehouse, then the result will be written in material quality report. This is to prevent this defective product from the production uses. There is no response in the corrective on the material quality problem from supplier A and D. These two suppliers will not be obtain responsiveness score. We have to monitor at IQC to prevent the problem recurrence in the production line.

5.2 Supplier Quality Improvement

5.2.1 Supplier Qualification Process

Supplier quality system assessment will be the first process before we will purchase products from them. Supplier quality system assessment is to obtain the supplier factory capability information. Their factory have to show the potential in many aspects from his organization strength , manufacturing capability to shop floor people skill including tools and equipment. In case of overseas suppliers, self assessment has been done by themselves. There are three overseas suppliers, supplier D, E and F, who supply the products to MOLEX Thailand LTD as overseas supplier. Supplier qualification has been assessed based on supplier self assessment. Quality system audit will be evaluated by MOLEX Thailand LTD, supplier management team (SMT) in case of local suppliers.

There are 7 sub systems that are considered in order to evaluated supplier manufacturing before purchasing the product from them.

1. Management and Personnel System : This sub system is to evaluate quality objective and responsibility within suppliers' company. How does their organization support the roles to achieve customer satisfactory and the formal quality manual is developed and implemented. Training provided to operators and inspectors before being allowed to work. The training program has been established both all operators and staffs.

2. Documentation: This sub system is to evaluate documentation in suppliers company to ensure that the current (up dated) specification, drawing process flow of their customers is available for manufacturing and the process evaluation to assure the customer specification through procedures distribution to shop floor.

3. Procurment/Material Control: This sub system is to evaluate supplier's capability for material control and procurement. How do they handle the customer complaint and provide sufficient corrective action. How well do they perform in coming inspection process , material storage and storage surrounding (temperature, shelf life audit and humidity). Also, the process and disposition on the defective material and store it away from the production line. Is there supplier certification program implementation and verification?

4. Manufacturing : Suppliers need to have their own manufacturing process flow chart which defines the flow from assemble until packaging the product including inspection control. How do they specifiy/perform test operation, inspection gates properly? Material in process/storage will have to be identified obviously and also proper housekeeping activity in place.

5. Final Inspection Gate: Procedure for final product inspection needed , also packaging methods. How well they apply SPC technique at final inspection gate? How well are their inspectors trained in accordance with the procedure/work instruction to ensure their skill?

6. Calibration : This sub system is to review the suppliers calibration and maintenance . How have calibration plan and documentary been maintained and followed up? How well are tools / equipment that are used for inspection, qualified based on international standard and also the personnel who perform calibration / maintenance trained and qualified. ?

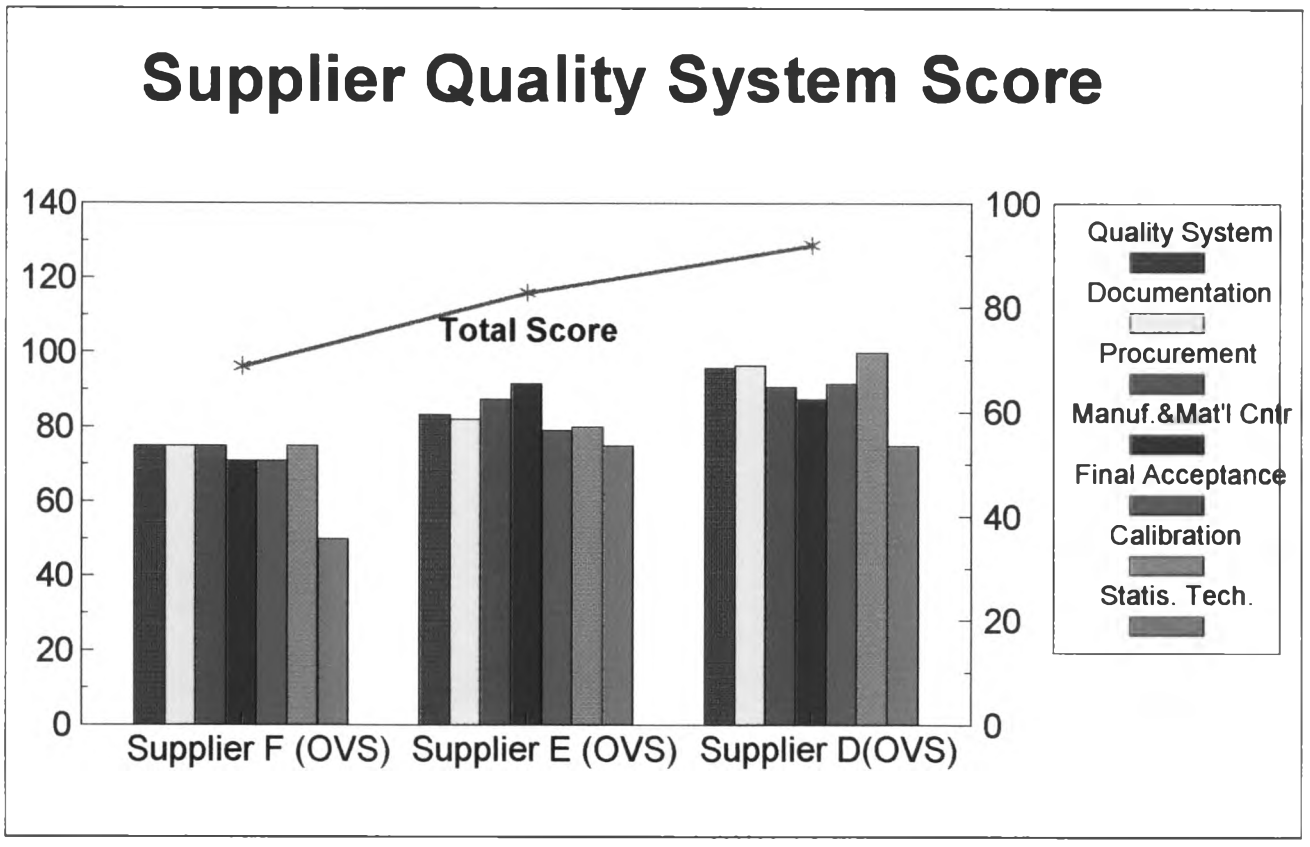
7. Statistical Technique Statistical Applied Method is required for suppliers manufacturing control. This method is to ensure that supplier manufacturing process is in state of control. This sub system covers statistical process control utilization in suppliers' manufacturing process. And also ,statistical technique /SPC training program are required for shop floor people, operators, inspectors. How well are the charts implemented properly and used to monitor the processes continuously?

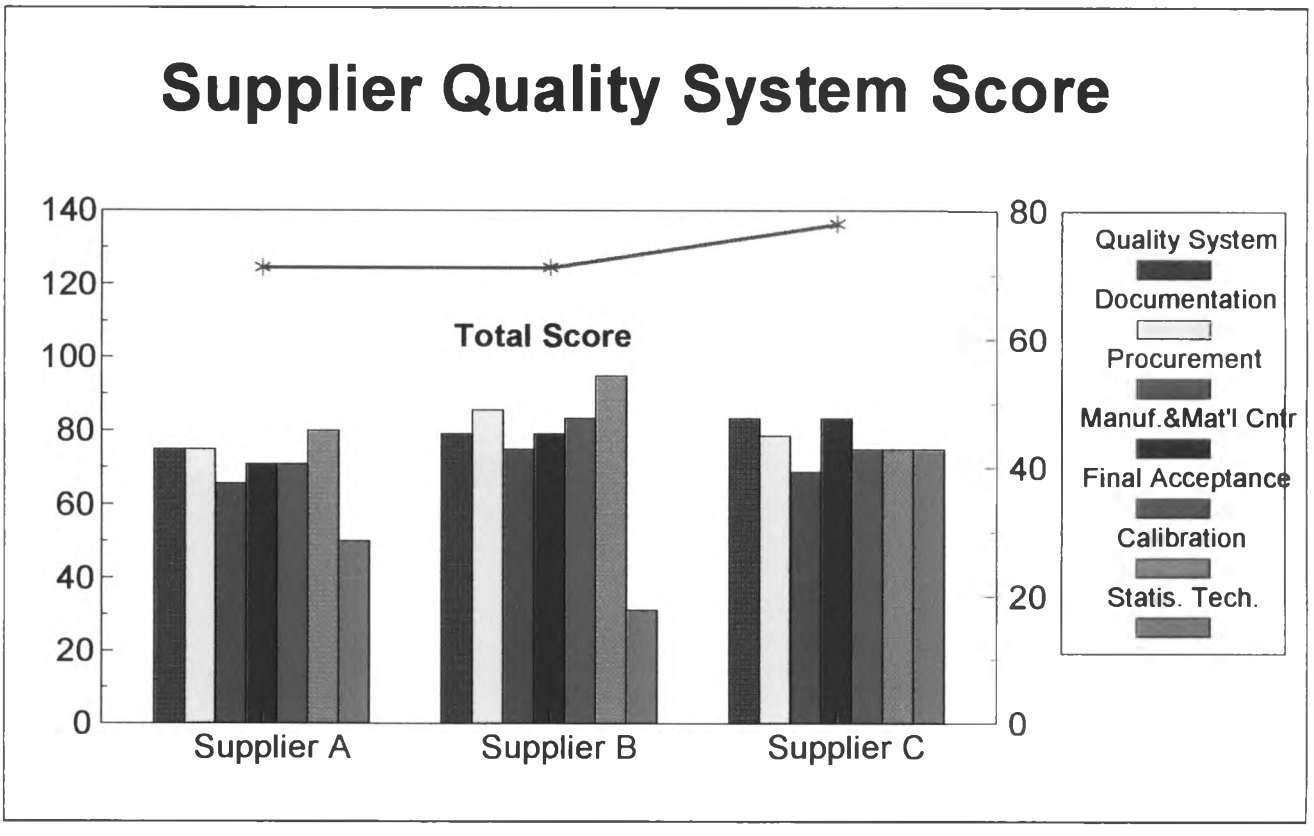
Supplier score results from supplier self assessment (for overseas suppliers) and quality system audit (for local suppliers) are shown in table 5.7.

		Supplier Name/Result(%)						
Sub System	**Weight**	A	B	C	D(Ovs)	E(Ovs)	F(Ovs)	**Category**
Mange&Persnnel	0.2	75	79.2	83.33	95.83	83.33	75	Conditional Apprv.
Documentation	0.1	75	85.7	78.57	96.43	82.14	75	Conditional Apprv.
Procurement	0.1	65.63	75	68.75	90.63	87.5	75	Conditional Apprv.
Manufacturing & Material Control	0.2	71	79.2	83.33	87.5	91.67	71	Conditional Apprv.
Final Acceptance	0.1	71	83.3	75	91.67	79.16	71	Conditional Apprv.
Calibration	0.1	80	95	75	100	80	75	Conditional Apprv.
Statistical Tech.	0.2	50	31.25	75	75	75	50	Conditional Apprv.
Total Score		**71.23**	**71.25**	**78.07**	**92.07**	**82.88**	**68.8**	

Table 5.7 Supplier Quality System Assessment Score

Source: Supplier Self Assessment & Quality System Evaluation result year 1998 of MOLEX Thailand LTD.





Graph 5.2 :Supplier Quality System Score Comparison (upper: Overseas Suppliers and lower: Local Suppliers

From the above result, it can be shown as graph 5.2 :Supplier Quality System Score Comparison. It can be said that supplier C has implemented statistical technique in his manufacturing. Supplier C supplier can supply us his statistical process control data to us to prove that his manufacturing is in stage of control. This supplier can supply the SPC data and also he can control his manufacturing parameter upon MOLEX Thailand Ltd. requirement. SPC utilization score in supplier periodic evaluation program will be given to this supplier.

Even through, statistical technique score of supplier D is 75%, but this is self assessment being assessed by supplier and this supplier has never provided us the SPC data , even any statistical technique data. In supplier periodic evaluation program, they will not obtain the SPC utilization score. And also, supplier E has high score in Statistical Technique but data has never been submitted to prove his process control capability.It can be seen that data of self assessment by the supplier is not reliable. All major suppliers will be classified in conditional approval category.

As a result, proposed supplier periodic evaluation program is to grade the material quality level of these major suppliers and verify supplier performance upon 6 quality factors as mentioned in chapter 4.2.2 Supplier Periodic Evaluation Program. This program will be done by supplier quality engineer. It can show the real performance of supplier.

5.2.2 Supplier Periodic Evaluation (Supplier Performance Rating)

Supplier Periodic Evaluation is the process to do supplier performance rating based on IQC (In coming section) data and supplier supplied data (SPC application method).

Supplier performance will be considered upon the following quality factors

Factors	**Weight**
- LAR.(Lot Acceptance Rate)	15
- Defect Per Million (DPM)	15
- Production Complaint (Line Feed Back) and Customer Complaint	15
- Responsiveness & Effectiveness of CAR	15
- Ship To Stock Program	10
- SPC Utilization	10

SUPPLIER	Total receiv ed lots	Total supp ed lots	Total inspec lots	Total rej. lots	% LAR	Total sample size	Total rej. parts	DPM	Line Purge (Item#)	% LFB ratio	LAR &DPM Score	MQP Score
A	126	-	126	0	100	246,440	0	0	1	0.79%	15+ 15	10
B	107	92	15	0	100	27,750	0	0	0	0.00%	15+15	15
C	7	-	7	0	100	37,480	0	0	0	0.00%	15+15	15
D	120	-	120	0	100	398,060	0	0	2	1.67%	15+15	5
E	19	-	19	1	94.74	27,730	300	10,818.61	0	0.00%	7+ 13	15
F	44	-	44	1	97.73	716,304	9,906	13,829.32	1	2.27%	10+13	10
Total	316	-	316	2	99.37 %	1426014	10206	24647.93	4	1.27%	-	-

Table 5.8 :Supplier Periodic Evaluation on LAR DPM and MQP quality factors
Source : IQC monthly report during Jul-Sep of MOLEX Thailand LTD.

In section 5.1.4 , three quality factors Lot Acceptance Rate & Defect Per Million and Material Quality Problems including itsdetail had been discussed And also, skip and ship to stock program result was explained in section 5.1.3. To evaluate supplier performance, remaining two quality factors will be described as follows,

- 5.2.2.1 Problem Recurrence (Effectiveness Of Corrective Action) & CAR Responsiveness

Supplier corrective action responsive time is tracked when the material quality problem is claimed to the supplier. There are 4 issues as shown in table 5.8 and 5.9.that the supplier need to take the corrective action. The result of responsive time in correction action is as below.

					Responsive Time(day)				
Supplier	Ref no.	Part no.	Defect Criteria	issued date	D3	D5	D8	Month To Date	Year To Date
F	2219	89880-0178	Outer Diameter Of PVC wire over spec.	98/09/17	-	-	18	18	20
A	2218	89880-0362	Damaged PVC wire		-	-	-	No Response	No Response
D	2197	599-9998-54	Damaged PVC wire (1)	98/09/07	-	-	-	No Response	No Response
	2215	89870-0068	Poor PVC insulator alignment (1)	98/07/15	-	-	-	No Response	No Response

Supplier A and D have never provided the corrective action after we have fed back to them, only supplier F has provided us the corrective action as explained in table 5.10. The

Table 5.9: Supplier Corrective Action Responsive Time Tracking Report
Source : Corrective action effectiveness progress report in September 1998 of MOLEX Thailand LTD.

defective samples and its information were sent to supplier for investigation but they have never given us the proper response.

8 D Steps	Actions
D1: Team Established	Establish a team to solve the problem
D2: Concern Description	Outer Diameter is over specification
D3: Interim Action	Check the balance wire at the finished goods ware house. There are a few rolls , production date in September. and all the result of outer diameter of PVC insulated wire is in specification.
D4: Root Cause	Due to the beginning of the production or changing of the conductor bobbin. The outer diameter PVC insulated wire may not constant and the affected part was not taken out
D5: Corrective Action	During beginning of production. All affected parts shall be scrapped away before producing the next batch.
D6: Implementation of permanent corrective action	Production supervisor informs all operator to scrap affected parts when running the beginning of the production and confirm with in process QC inspectors. for inspection confirmation.
D7: Actions to prevent recurrence	The procedure has been added in work instruction for extrusion section. In process QC inspectors keep monitoring the O.D until the problem is totally solved. Implement the control chart to the PVC insulated wire outer diameter.
D8 : Congratulation the team	-

Table 5.10: Supplier Corrective Action on Outer Diameter Over Specification of PVC insulated wire
Source : Corrective Action Report of F Supplier as shown in appendix VI

After receiving the corrective action (as shown in appendix VI), MOLEX Thailand LTD, keeps monitoring the 3 next lot to see the effectiveness of the corrective action including the quality problem issues of the supplier A and D who have never responded the corrective action . Problem recurrence & effectiveness of the corrective action monitoring report is shown as table 5.11.

Supplier	Ref no.	Part no.	Defect Criteria	Effective date of CAR	3 incom. lot monitoring after CAR	Result	Responsiveness & CAR Effectiveness Score (15%)
F	2219	89880-0178	Outer Diameter Of PVC wire over spec.	98/10/10	3	No Rej.	12.5
A	2218	89880-0362	Damaged PVC wire	-	4	No Rej.	7.5
D	2197	599-9998-54	Damaged PVC wire (1)	-	5	No Rej.	7.5
	2215	89870-0068	Poor PVC insulation alignment (1)	-	3	No Rej.	7.5

Table 5.11: Problem Recurrence (Effectiveness Of Corrective Action) & CAR Responsiveness Monitoring Report

Source : Corrective action effectiveness progress report in October 1998 of MOLEX Thailand LTD.

Even though, supplier A and D have never fed back the corrective action but according to IQC historical data record, the material quality problems have never recurred in the 3 next lot. Therefore, there is no problem recurrence but no corrective action responsiveness. The score of responsiveness & CAR Effectiveness Score has been given to these suppliers as shown in Table 5.11 (Score 7.5 marks for responsive time the corrective action report and score 7.5 marks for recurrence problem to review effectiveness of the corrective action , have been given for this factor).

- 5.2.2.2 Statistical Process Control

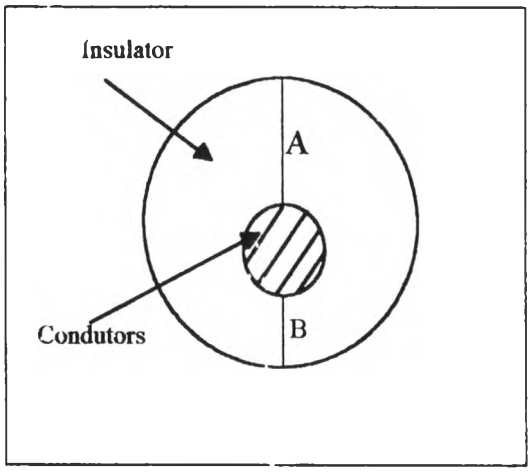
Two suppliers have controlled their manufacturing by using statistical process control, SupplierC and F . This data has been sent through internet.

SPC parameters calculation spread sheet has been established on spread sheet software (Lotus 123 by Lotus Development Corporation), then submit to these two supplier in order to record on this spread sheet then statistical parameters and Cpk will be calculated automatically by this SPC spread sheet.

This spread sheet is developed on the soft ware then provide to the suppliers. This is to contribute the supplier to keep implementing SPC in their manufacturing. It is more comfortable to submit the electronics data through internet.

Two parameter that the supplier has controlled for us , concentricity ratio and outer diameter of insulated wire. Concentricity ratio definition is as below,

Lower specification limit (70%) has been considered as significant parameter. Upper specification limit (100%) is the best, therefore , SPC implementation, we consider the



Concentricity Ratio = (A/B)*100

Best Concentricity is 100% ==> (A=B)
Poor Concentricity is lower than 70%

concentricity ratio at the lower specification (controlled) limit because we actually want high concentricity between A,B. As a result, upper specification /controlled limit for concentricity is supposed to be overlooked in case of out of upper specification/controoled limit.

From graph 5.3 :SPC for insulated wire concentricity ratio from supplier C with Cpk 1.20 and there are 4 points , point no. 1,4,11,16,, that had moved out of LCL. It can be seen that high standard deviation value 3.89 leads to low Cpk. There are two issues that this supplier do not figure out their manufacturing process. One is the way that they utilize the data of the significant statistical parameters such as standard deviation and individual average value (X bar), they do not take the action on that machine such as re set up and adjusting the machine on that time. Another one is that they has monitored concentricity of the thickness of the insulated wire based on its upper and lower specification limit , if there is no out of specification value they will not take any action on the machine/process. Actually, if individual average value moves out of lower control limit. Action is required such as sorting on the product that are produced in that period also, the machine adjustment needed by technician at that time that individual average value is either out upper control limit or lower control limit.

In the same way,from graph 5.4 :SPC for insulated wire outer diameter from supplier C although Cpk 1.48, but there are 5 out of controlled limit points , point no. 1, 4 , 5 , 6 and 14, it can be seen that three consecutive points are out of controlled limit without supplier action at that period. They has considered that individual average value based on upper specification limit and lower specification limit , not upper and lower controlled limit.

Perold : Jul-Sep

VARIABLE CONTROL CHART FOR SUPPLIER C

Operation EXTRUSION M/C NO. EXT 04

upper spec limit -

lower spec limit 70.00

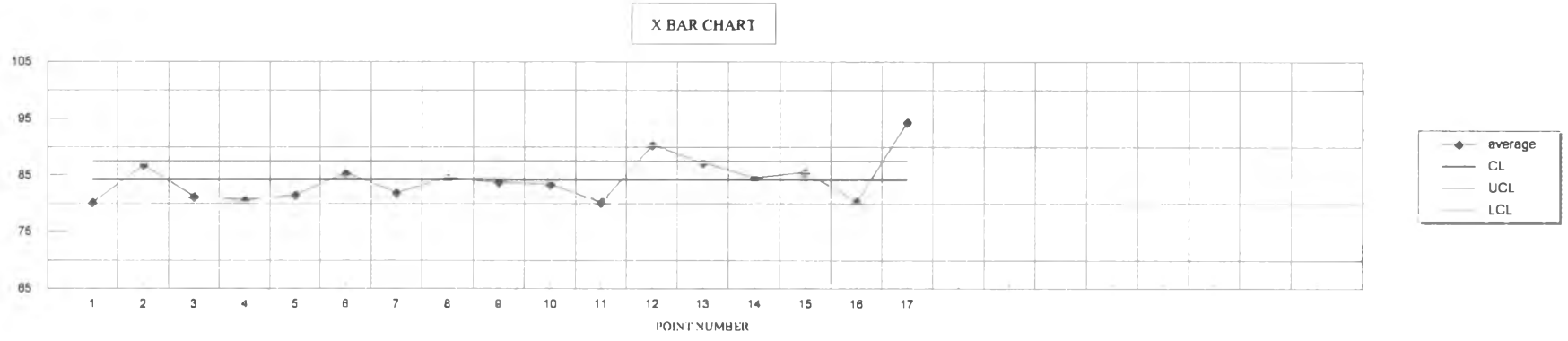
Controlled Parameter : Concentricity ratio of Insulated Wire

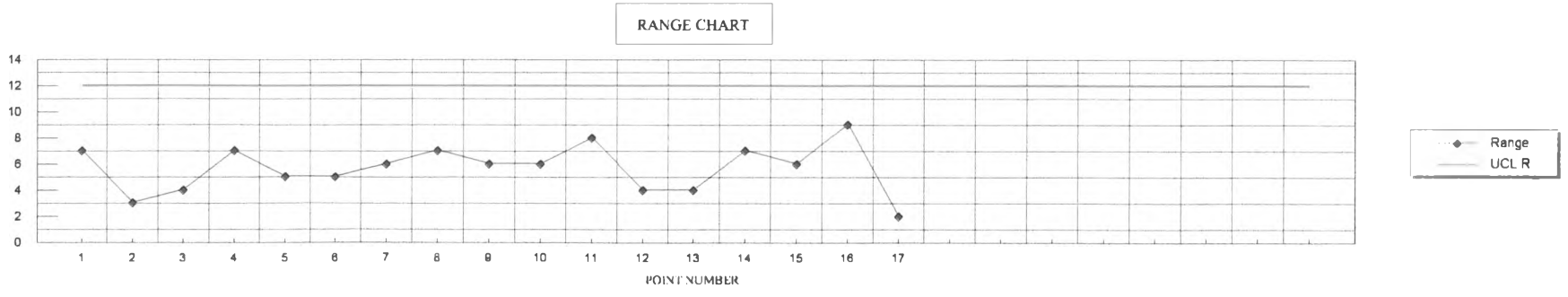
No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
measurement	1	78.00	87.00	81.00	80.00	78.00	87.00	83.00	84.00	82.00	86.00	78.00	88.00	89.00	86.00	86.00	76.00	95.00
	2	80.00	85.00	82.00	79.00	83.00	84.00	84.00	85.00	85.00	85.00	82.00	92.00	88.00	84.00	84.00	80.00	94.00
	3	85.00	88.00	80.00	80.00	82.00	86.00	78.00	87.00	83.00	80.00	80.00	90.00	87.00	85.00	88.00	78.00	93.00
	4	79.00	86.00	79.00	85.00	81.00	87.00	84.00	86.00	87.00	84.00	76.00	90.00	86.00	87.00	87.00	82.00	94.00
	5	78.00	87.00	83.00	78.00	83.00	82.00	80.00	80.00	81.00	81.00	84.00	91.00	85.00	80.00	82.00	85.00	95.00
Average		80.00	86.60	81.00	80.40	81.40	85.20	81.80	84.40	83.60	83.20	80.00	90.20	87.00	84.40	85.40	80.20	94.20
Range		7.00	3.00	4.00	7.00	5.00	5.00	6.00	7.00	6.00	6.00	8.00	4.00	4.00	7.00	6.00	9.00	2.00

$\bar{X}$ = 84.059 UCL X = 87.317 UCL R = 11.94 Z ucl = 0.00

R = 5.647 LCL X = 80.800 S = 3.89 Z lcl = -3.61

Cpk = **1.20**





Graph 5.3 :SPC for concentricity ratio: supplier C

Perold : Jul-Sep

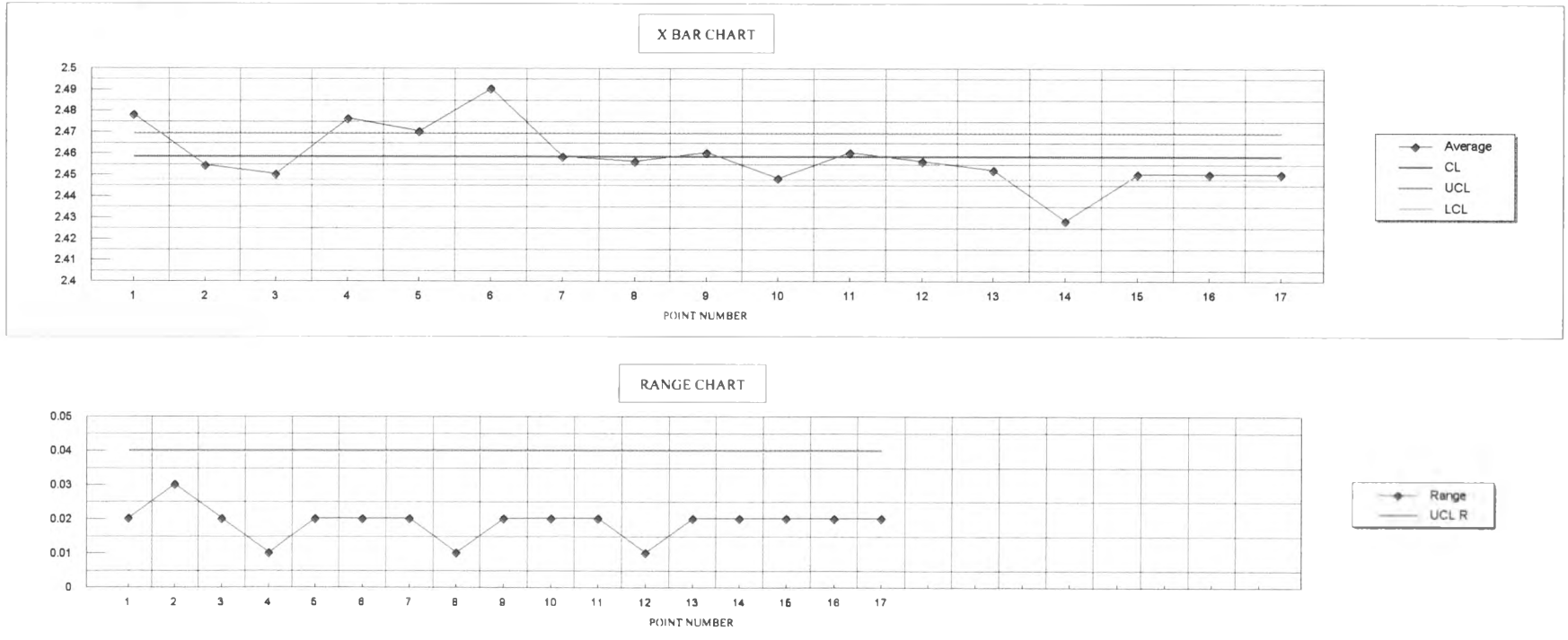
VARIABLE CONTROL CHART OF SUPPLIER C

Operation EXTRUSION M/C NO 5
upper spec limit 2 52 Controlled Parameter : Outer Diameter Of Insulated Wire
lower spec limit 2 40

No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
measurement	1	2 48	2 44	2 45	2 48	2 47	2 49	2 45	2 46	2 45	2 44	2 46	2 46	2 45	2 42	2 46	2 44	2 45
	2	2 49	2 45	2 45	2 48	2 48	2 50	2 46	2 45	2 47	2 45	2 47	2 45	2 44	2 43	2 45	2 45	2 46
	3	2 47	2 47	2 46	2 47	2 47	2 48	2 47	2 45	2 46	2 46	2 45	2 45	2 46	2 42	2 45	2 46	2 44
	4	2 47	2 46	2 44	2 47	2 46	2 49	2 46	2 46	2 46	2 44	2 46	2 46	2 46	2 44	2 44	2 45	2 45
	5	2 48	2 45	2 45	2 48	2 47	2 49	2 45	2 46	2 46	2 45	2 46	2 46	2 45	2 43	2 45	2 45	2 45
Average		2 48	2 45	2 45	2 48	2 47	2 49	2 46	2 46	2 46	2 45	2 46	2 46	2 45	2 43	2 45	2 45	2 45
Range		0 02	0 03	0 02	0 01	0 02	0 02	0 02	0 01	0 02	0 02	0 02	0 01	0 02	0 02	0 02	0 02	0 02

$\bar{X}$ = 2 458 UCL X = 2 469 UCL R = 0 04 Z ucl = 4 37
$\bar{R}$ = 0 019 LCL X = 2 447 S = 0 014 Z lcl = 4 09

Cpk = **1 48**



Graph 5.4 :SPC for insulated wire outer diameter from supplier C

Perold : Jul-Sep

VARIABLE CONTROL CHART FOR SUPPLIER F

Operatio EXTRUSION M/C NO. 5

upper spec limit

Controlled Parameter : Thickness Of Insulated Wire(UL1007)

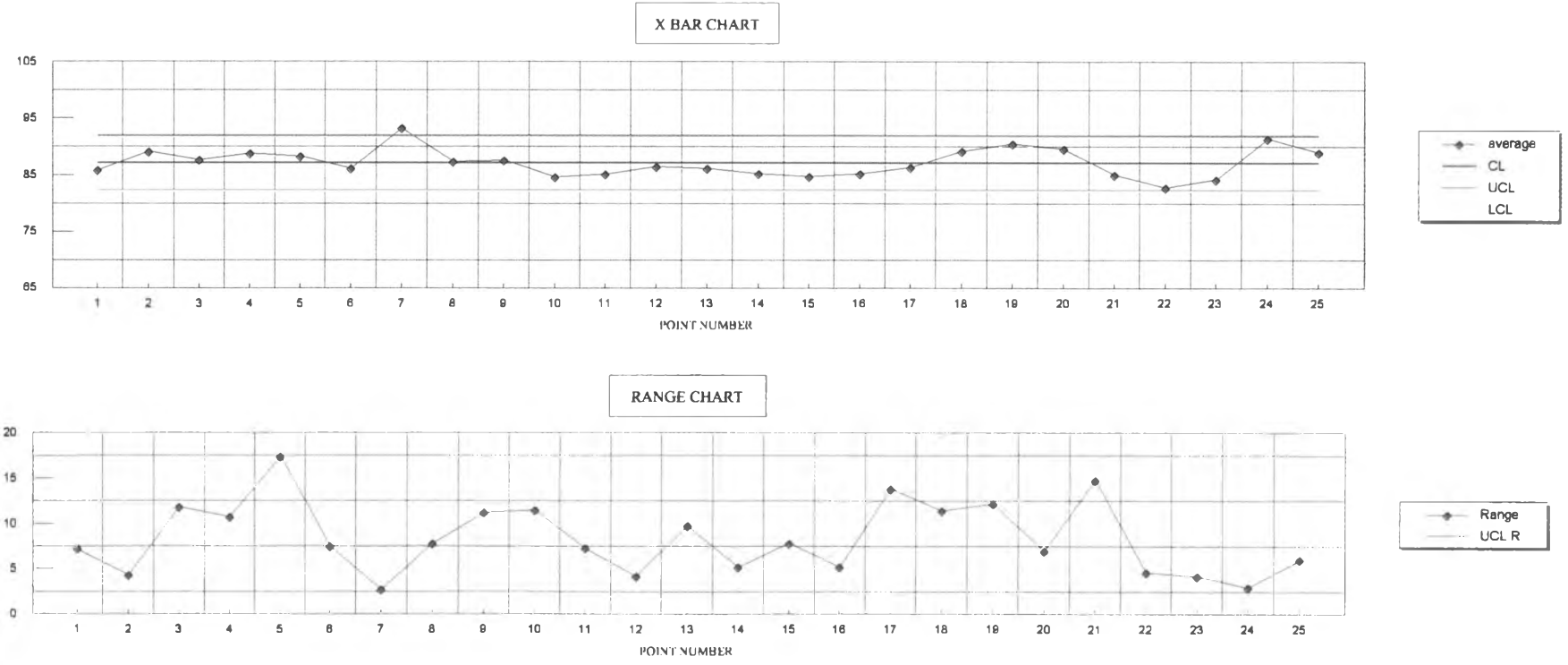
lower spec limit 70.00

No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
measurement	1	80.90	88.80	84.80	86.30	90.50	80.90	92.20	86.90	87.10	86.00	87.50	86.90	86.00	83.20	88.60	83.20	92.90	82.90	82.60	87.10	84.80	85.20	82.90	92.40	86.90
	2	86.70	88.70	80.90	87.40	93.80	86.40	92.90	91.60	88.20	81.60	86.70	87.00	85.70	88.30	80.90	88.30	84.50	93.10	88.60	91.90	86.10	82.50	84.40	91.20	86.70
	3	88.00	87.00	92.60	92.50	92.70	87.00	94.80	86.90	83.00	78.20	82.60	85.40	80.90	84.30	85.70	84.30	82.50	87.70	92.30	92.30	85.60	80.70	81.90	90.90	90.50
	4	86.50	88.80	92.50	83.20	86.90	88.30	93.00	86.80	84.40	87.00	80.30	88.10	86.70	85.30	80.90	85.30	91.90	87.30	93.70	90.50	76.60	82.80	86.00	92.40	92.60
	5	86.10	91.20	86.60	93.80	76.50	87.40	92.80	83.90	94.10	89.60	87.50	84.00	90.60	84.30	86.70	84.30	79.20	94.20	94.70	85.40	91.30	82.20	84.90	89.50	87.40
Average		85.64	88.90	87.48	88.64	88.08	86.00	93.14	87.22	87.36	84.48	84.92	86.28	85.98	85.08	84.56	85.08	86.20	89.04	90.38	89.44	84.88	82.68	84.02	91.28	88.82
Range		7.10	4.20	11.70	10.60	17.30	7.40	2.60	7.70	11.10	11.40	7.20	4.10	9.70	5.10	7.70	5.10	13.70	11.30	12.10	6.90	14.70	4.50	4.10	2.90	5.90

$\bar{\bar{X}}$ = 87.023 UCL $\bar{\bar{X}}$ = 91.780 UCL R = 17.43 Z ucl = 0.00

$\bar{R}$ = 8.244 LCL $\bar{\bar{X}}$ = 82.266 S = 4.11 Z lcl = -4.14

Cpk = **1.38**



Graph 5.5 :SPC for concentricity ratio : supplier F

Supplier F has controlled the thickness of the insulate wire as shown in Graph 5.5 :SPC for concentricity ratio. Their Cpk is 1.38.There is no out of lower controlled limit point. Only one out of upper controlled limit point that we do not consider as critical point. In this considered period, they do not implement SPC to control the outer diameter of the insulated wire.

From the R bar graph 5.3 and 5.5 , it can be said that his precision on concentricity ratio from the machines have fluctuated along the R exist. This means that the the precision of the machines are not stable, the supplier need to perform machine maintenance. The procedure for machine maintenance need to have , and its schedule need to be defined.

From graph 5.3,5.4,5.5, it can be summarized in table 5.12 as below,

	Supplier C		
Controlled parameter.	**No. of point points Out of lower controlled limit**	**No. of point points Out of upper controlled limit**	**Cpk**
Concentricity ratio of insulated wire	4 (1,4,11,16)	2 (12,17)	1.2
Outer diameter of insulated wire	1 (14)	4 (1,4,5,6)	1.48
	Supplier F		
Concentricity ratio of insulated wire	None	1 (7)	1.38

Table 5.12: Result of SPC utilization of supplier C and F
Source: SPC supplied data of supplier C and F during Jul-Sep 1998

In conclusion, these two supplier meets our requirement in SPC utilization also, to use SPC as a tool to control process. The suppliers will have to know the way to improve their machine during running the production. The action will have to be taken properly when there is a out of controlled point during producing the product.

Supplier Periodic Evaluation during Jul - Sep 1998

As a result of 5 quality factors, supplier performance rating evaluation on their products are as shown in table 5.13,

SUPPLIER	Quality Factors						
	Lot Acceptance Rate	Defect Per Million	Material Quality Problem	Responsive Time& Problem Recurrence	Skip& Ship To Stock Program	SPC Utilization	Total Score
C	15	15	15	15	3.3	10	**73.3**
B	15	15	15	15	5	0	**65**
F	10	13	10	7.5	3.3	10	**53.8**
E	7	13	15	15	3.3	0	**53.3**
A	15	15	10	7.5	3.33	0	**50.83**
D	15	15	5	7.5	3.3	0	**45.8**
MEAN							**57.01**

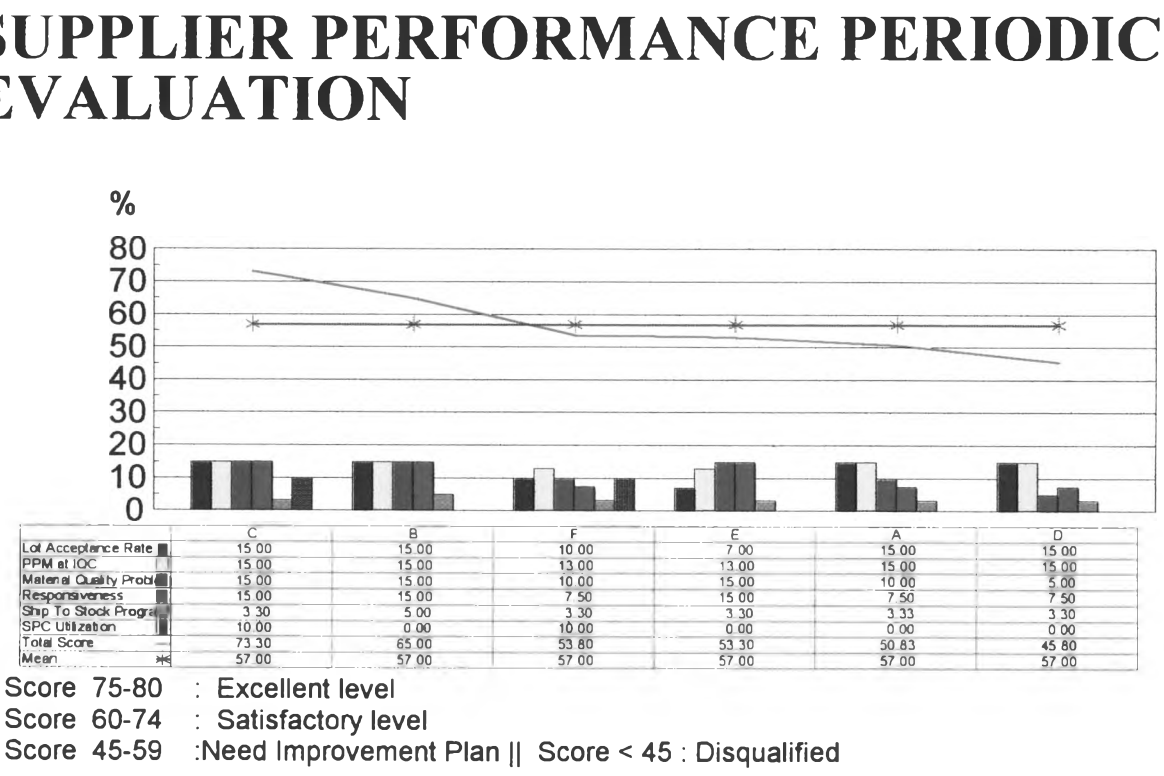
Table 5.13: Score result from supplier performance periodic evaluation
Source : Supplier Periordic Evaluation report of period Jul-Sep 1998

Supplier C has never been found the product quality problem both at IQC gate and in the production line and also, SPC utilization in their process is applied properly. However, their product quality does not meet our requirement in order to apply skip & ship to stock program. Although , there is no product quality problem of supplier B 's products, but this supplier does not contribute to implement SPC in their manufacturing , no evidence of SPC implementation . It can be seen that supplier B 's manufacturing process will face to process stability problem in long term even though its products have never been found the product quality problem at IQC gate and production line of MOLEX Thailand LTD .

Product quality problems of supplier F, were found at IQC gate and production line of MOLEX Thailand LTD, . The corrective action was implemented properly. SPC utilization has been used in its manufacturing process. That means the product quality has been monitored. This shows the potential strength in manufacturing process control in long term.

Supplier E has one product quality problem over this period, wrong color of tube product 1 lot was supplied to MOLEX Thailand LTD, but they made the replacement on that day. This occurred because of miscommunication within supplier' staff group. No support evidence of SPC utilization in its manufacturing process , this is the weak area of this supplier.

Product quality problems has been found on products of supplier A and D, they do not respond the proper action including corrective action the quality problem. Also, there is no SPC utilization in their process. These two suppliers have never responded the proper action or any improvement plan to MOLEX Thailand Ltd. The result of supplier periodic evaluation is as in graph 5.6 below,



Graph 5.6 : Supplier Performance Periodic Evaluation
Source : Supplier Periodic Evaluation report of period Jul-Sep 1998

It can be said that no supplier can be approved supplier in MOLEX Thailand LTD, those suppliers can be conditional approved suppliers in short term period and this program needed to be continued in order to monitor and evaluate supplier periodic evaluation. Also, supplier performance feed back process is important thing that those suppliers have to acknowledge his performance and provide good co operation to MOLEX Thailand LTD to make the improvement on their product that are material for finished goods assembly of MOLEX Thailand LTD.

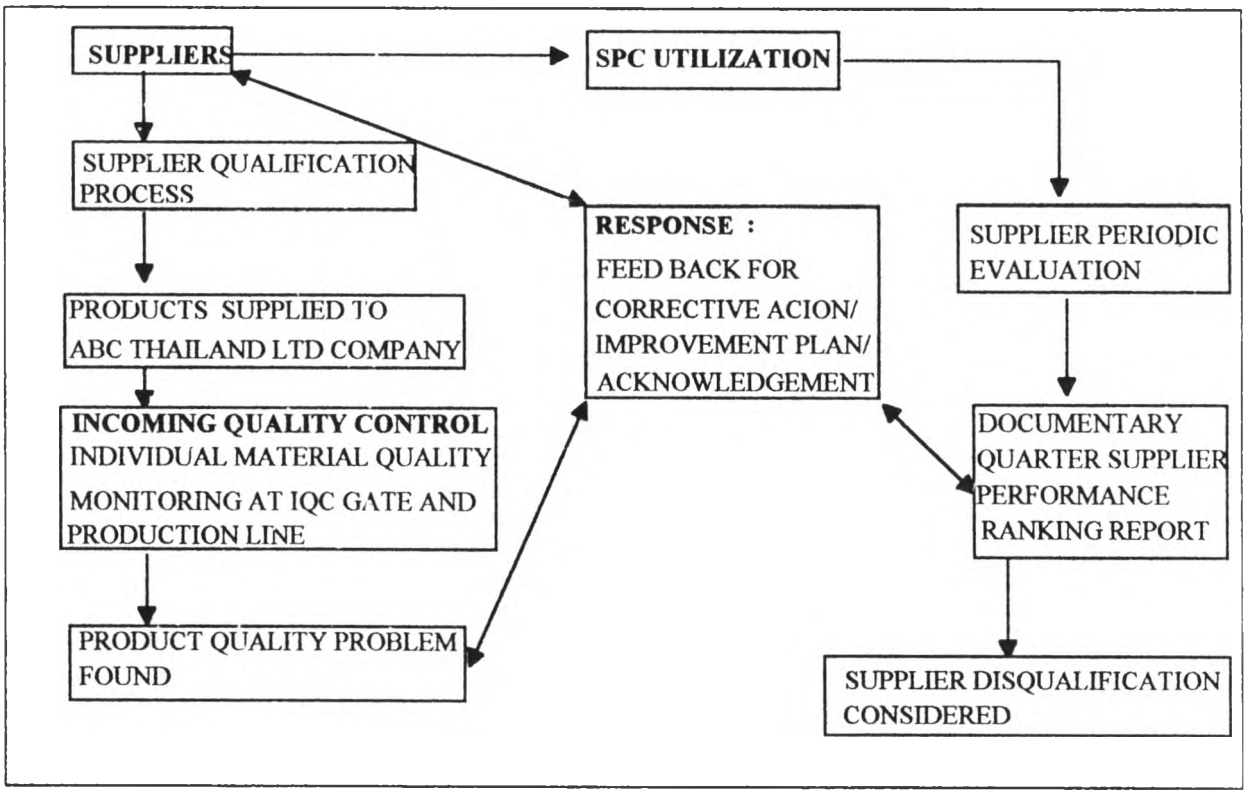


Figure 5.3 : Interaction between suppliers and MOLEX Thailand LTD company

In conclusion , supplier quality management activities is as in figure 5.3. supplier A has responded in negative way and never have the positive improvement plan . This supplier will be disqualified upon proposed method as mentioned in chapter 4.2.3 Supplier Disqualification Process. The MOLEX Thailand LTD products , its material will be transited to the other suppliers who can give us strong /positive co operation and responsiveness.

5.2.3 Supplier Disqualification Process

As proposed method in chapter 4.2.3, supplier disqualification process has been proposed to functional manager to terminate supplier A , based on the supplier periodic evaluation and result of supplier response. Supplier management team reviewed the result of supplier response. It can be said that this supplier responded back to MOLEX Thailand LTD in negative way. The improvement plan will not be submitted, no co operation to MOLEX Thailand LTD. As a result, SMT proposes to disqualify this supplier to functional managers and top management team. They agree to disqualify this supplier but SMT will be responsible for product transition. All MOLEX Thailand LTD 's products that use material of supplier A will be removed to the other suppliers who have better quality and co operation.

Supplier Disqualification Proposal

Date 98/10/07

Supplier name Supplier A

Assessment/Quality Audit Score 71.23

Location

SALES 947/23-24 THOSAPHOL LAND BUILDING 4 6 th FLOOR BANGNA TRAD RD KM. 3 BANGNA BANGKOK 10260

FACTORY 52 MOO 5 TAMBOL NONGKAKHA AMPHUR PHANTHONG CHONCURI

QA Engineer 's justification

According to supplier periodic performance ranking/review, Thaiwonderful Wire & Cable Co., Ltd. obtained score 50.83 , Level 5(E) from 6 major suppliers . This score is required improvement plan ,(please attachment for reference) but they will not provide any improvement plan to show his capability in his process.

And also, they showed bad behaviour /response to us. It can be said that they have no improvement capability to support our company. As a result, supplier management team proposes to disqualify this supplier. His product will not be used for any our new product development and matenal selection, also the existing products , we are reviewing to switch our source under price, delivery , quality and responsiveness consideration.

Agreed by

Buyer 98/10/07 — 98/10/08.

Engineer 98-10-08.

Comment Recommendation

Approved by

QA Manager 9 OCT 98

Material Manager 98/10/10

Comment Recommendation

After this proposal is approved an acknowledgement must be made to all related staffs. This supplier has never shown an intention or sign of positive improvement to us since last two years.

Agreed by

General Manager 98/10/09

Comment / Recommendation

TEAM SHOULD BE SET UP TO ENSURE SMOOTH TRANSITION AND ADDRESS OR ISSUES FROM INT. SALES + CUSTOMER. (MATH:- DEPT TO LEAD, QA :- FACILITATOR)

SALES MGR:

THQA 0124A

Figure 5.4 : Supplier Disqualification Proposal for functional management review

5.3 Improvement Result Comparison Between Before and After Implementation

5.3.1 Goal Review After Supplier Quality Improvement Implementation

From chapter 4 section 4.1.4 IQC data utilization, lot acceptance rate and production complaint (line feed back rate), had been reviewed during Jul 98 - Nov 98 (after implementing the supplier quality improvement.

	Total incoming lot	Total accep lot	Total % LAR	Supplier											
				A	% LAR	B	% LAR	C	% LAR	D	% LAR	E	% LAR	F	% LAR
Jan98	130	120	92.31	48	100	15	100	6	83.3	7	71.4	7	85.7	2	100
Feb98	167	164	98.2	44	100	41	100	6	83.3	41	95.4	1	100	0	100
Mar98	155	151	97.42	41	97.6	11	100	1	100	44	100	7	100	2	100
Apr98	279	276	98.92	104	100	25	100	1	100	43	100	33	94	1	100
May98	155	154	99.35	28	100	19	100	1	100	34	100	0	0	5	100
Total	886	865	**97.63**	265	99.57	111	100	15	94	169	94	48	95.43	10	100
10 % imprv (Goal)	-	-	**98**	-	**99.6**	-	**100**	-	**94**	-	**94**	-	**95.5**	-	**100**

Table 4.1(chapter 4): Lot Acceptance Rate during Jan 98 - May 98 (Before implementation)
Source: IQC monthly report (Jan 98 - May 98) , MOLEX Thailand LTD.

	Total incoming lot	Total accep lot	Total % LAR	Supplier											
				A	% LAR	B	% LAR	C	% LAR	D	% LAR	E	% LAR	F	% LAR
Jul 98	184	182	98.91	18	100	14	100	1	100	40	100	8	88	5	100
Aug98	250	248	99.2	51	100	30	100	4	100	59	100	7	100	13	100
Sep98	169	166	98.22	57	100	46	100	2	100	21	100	4	100	4	100
Oct98	179	171	95.53	33	94	26	100	0	0	37	100	6	100	7	100
Nov98	217	213	98.16	58	100	55	100	7	87.5	29	100	0	0	4	100
Total	**999**	**980**	**98.1**	**217**	**99.1**	**171**	**100**	**14**	**93**	**166**	**100**	**25**	**96**	**33**	**100**
Goal			**98**		**99.6**		**100**		**94**		**94**		**95.5**		**100**

Table 5.14: Lot Acceptance Rate during Jul 98 - Nov 98 (After implementation) versus goal
Source: IQC monthly report (Jul 98 - Nov 98) , MOLEX Thailand LTD.

As explained in the chapter 4, goal to monitor lot acceptance rate and production complaint rate(line feed back) had been set based the lot acceptance rate and production complaint rate during Jan 98 - May 98. Goal for lot acceptance rate was set at 98% and production complaint rate was set at 2.25 %. Incoming quality control section would perform inspection then submit the weekly report to QA Engineer. Every month QA engineer would have to review both lot acceptance rate and production complaint rate including the corrective action to reduce the rejection rate in production.

From table 5.14, lot acceptance rate performance during Jan 98 - May 98 is 97.63%. After implementation, the lot acceptance rates of the products that has been supplied by supplier B, D, E meet goal with 10 % improvement. This lead to goal achievement in lot acceptance rate of overall supplier that is 98.10%. It can be said that the lot acceptance rate at IQC has been increased by 10% based on 97.63%.

However, the product from supplier A and C had been found its quality problem during incoming inspection. Lot acceptance rates of supplier A and C are less than goal by 0.5 and 1 % respectively. One rejected lot of total 217 lots of supplier A product, was found in Oct 98 during incoming inspection and one rejected lot of total 14 lots of supplier C was found in Nov 98. This lead to lot acceptance rate over its goal but the amount of these two rejected lots does not impact to overall goal of 98.00 %. And the suppliers have provided the corrective action properly.

Although, IQC section had found the rejected item during incoming inspection on the products that had been supplied by supplier A and C but the rate does not impact to the goal of total lot acceptance rate. It can be seen that lot acceptance rate has been increased by 10% after implementing the supplier quality improvement to MOLEX Thailand LTD.

	Total incoming lot	Total Items	LFB rate (%)		Supplier										
				A	%LFB	B	%LFB	C	%LFB	D	%LFB	E	%LFB	F	%LFB
Jan98	130	6	4.62	48	2.08	15	0	6	0	7	0	7	0	2	0
Feb98	167	1	0.6	44	0	41	0	6	16.67	41	0	1	0	0	0
Mar98	155	1	0.65	41	2.44	11	0	1	0	44	0	7	0	2	0
Apr98	279	8	2.87	104	0	25	0	1	0	43	4.65	33	0	1	0
May98	155	7	4.52	28	7.14	19	0	1	100	34	2.94	0	0	5	0
Total	886	23	2.65	265	2.33	111	0	15	23.33	169	1.52	48	0	10	0
15 % imprv.	-	-	**2.25**	-	**2**	-	**0**	-	**19**	-	**1.3**	-	**0**	-	**0**

Table 4.2(from chapter 4) : Production complaint (Line Feed Back (% LFB)) during Jan 98 - May 98 (Before implementation)

Source: IQC monthly report (Jan 98 - May 98) , MOLEX Thailand LTD.

	Total incoming lot	Total Items	LFB rate (%)		Supplier										
				A	%LFB	B	%LFB	C	%LFB	D	%LFB	E	%LFB	F	%LFB
Jul 98	184	2	1.09	18	0	14	0	1	0	40	2.5	8	0	5	0
Aug98	250	0	0	51	0	30	0	4	0	59	0	7	0	13	0
Sep98	169	4	2.37	57	1.75	46	0	2	0	21	4.76	4	0	4	0
Oct98	179	4	2.23	33	3	26	1	0	0	37	0	6	0	7	0
Nov98	217	4	1.84	58	6.9	55	0	7	0	29	0	0	0	4	0
Total	**999**	**14**	**1.4**	**217**	**2.76**	**171**	**0.58**	**14**	**0**	**166**	**1.08**	**25**	**0**	**33**	**0**
Goal	-	-	**2.25**	-	**2**	-	**0**	-	**19**	-	**1.3**	-	**0**	-	**0**

Table 5.15: Production complaint (Line Feed Back (% LFB)) during Jul 98 - Nov 98 (After implementation) versus goal.

Source: IQC monthly report (Jul 98 - Nov 98) , MOLEX Thailand LTD.

From table 5.15, production complaint rate (line feed back) performance during Jan 98 - May 98 is 2.65%. After implementation, the production complaint rate on the products has reduced by 47%. The production complaint rate has been reduced from 2.65 % to 1.4 % . The target was set at 2.25% (15 % reduction from 2.65%). This lead to goal achievement in production complaint rate reduction. It can be said that the production complaint rate has been reduced by 47 %.

However, the product from supplier A and B were found the quality problem in the production line. Supplier A , 6 rejected items of 217 lots were found the quality problems (Insulation damaged, Wrong type of PVC wire) in the production line. This lead to high production complaint rate (over goal). Goal of production complaint rate for supplier A is 2.00 % but it is 2.76% in actual. Supplier B, 1 rejected item of 171 lots were found the quality problem (Bond strength between insulator and conductor is over specification) in the production line. This lead to high production complaint rate (over goal). Goal of production complaint rate for supplier B is 0.00 % but it is 0.58% in actual. However, these rejected items do not impact to overall goal of production complaint rate. And the quality problems have been solved properly by the suppliers.

It can be said that the production complaint rate has been reduced since Jul 98 - Nov 98, with 47 % improvement.

5.3.2 Proposed methods improve supplier quality management of MOLEX Thailand LTD

5.3.2.1 Incoming Quality Control

Proposed incoming inspection plan for incoming inspection has been utilized effectively in order to detect the potential failure that could occur in the supplier manufacturing process. The work instruction based on MIL STD 105E sampling plan also has been used for incoming inspection to prevent the product entering the production. This leads to production complaint rate reduction.

Proposed work instruction and incoming quality control is explained obviously as official document for MOLEX Thailand LTD. It can be used as standard procedure for both staff and incoming inspection personnel. After implementation, these methods has been implemented properly in this factory. QA engineer are responsible for procedure development.

It can be said that after implementation, both proposed incoming quality control process has been implemented properly. However, it need to be developed continuously as appropriate.

5.3.2.2 Supplier Quality Management

Suppler qualification process and quality system audit had been agreed by supplier management team consisting of purchasers, product engineers and QA engineers. It had been implemented properly. Supplier Periodic Evaluation had been implemented and its concepts had been agreed by SMT team. These are the new procedures that are proposed to MOLEX Thailand LTD. It will be developed by QA engineer as continuos improvement.

Supplier 's responsiveness has been tracked in order to know his co-operation, and also the corrective action to solve the quality problem has been driven to the suppliers in order to improve the quality of production at supplier site. Its purpose is to reduce the production rejection at IQC section when the products arrive the factory.

Relationship between MOLEX Thailand LTD and the suppliers has been improved, communication in aspect of purchasing , quality issue, product development to keep developing in product (finished goods product ion MOLEX Thailand LTD) quality improvement. Supplier performance rating result has been used in stage of new project/production development as called material selection. The products of the suppliers who have good performance will have more potential in material selection for MOLEX Thailand LTD product.

After implementation, products (material) quality performance have been monitored and its data has been used to reflect the quality of the products to the suppliers so that they will improve both their product itself and process control to keep it in state of control